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Management of Non Proliferative Diabetic Retinopathy (NPDR) through Ayurveda - A Case Report

Dr Deepika M[1*], Dr Sandhyarani D[2], Dr Thoppe Sridhar Vayishnavi[3]

[1*]PG Scholar, Department of PG Studies in Shalakya Tantra, JSSAMC&H, Mysuru, India
[2]Professor, Department of PG Studies in Shalakya Tantra, JSSAMC&H, Mysuru, India
[3]PG Scholar, Department of PG Studies in Shalakya Tantra, JSSAMC&H, Mysuru, India
***Corresponding Author**: Dr Deepika M.
Contact: deepikamohan155@gmail.com

Abstract:
Introduction: Diabetic Retinopathy (NPDR) is a micro vascular complication of diabetes that affects the retina and is a leading cause of blindness in working-age adults, with a national prevalence of 12.5% for Diabetic Retinopathy and 4.0% for VTDR. Ayurveda prioritizes eye health and offers specialized treatments under *Netra Kriyakalpa*, with *Netra Tarpana* specifically indicated for nourishing ocular structures.
Objectives: To evaluate the therapeutic efficacy of *Sadyovirechana* and *Shatahvadi Ghrita Netra Tarpana* in the management of *Pramehajanya Timira* (Non-proliferative Diabetic Retinopathy), through assessing improvements in visual function, retinal health.
Methodology: A 52-year-old male patient, who is a known case of Type 2 Diabetes Mellitus since 10 years visited *Shalakya Tantra* OPD at JSSAMC&H with the complaints of blurring of vision since 6 months and on evaluation he was diagnosed with Non proliferative Diabetic Retinopathy. Based on the *Nidana* (Causative factors) and *Samprapthi* (Pathogenesis) of *Prameha* (Diabetes Mellitus) the ocular complications were understood and the following treatment plan was adopted.
1. *Sadyovirechana* (Therapeutic Purgation): *Gandharvahastadi Eranda Taila* administered for one day to eliminate systemic toxins.
2. *Netra Tarpana* (Ocular Nourishing Treatment): *Shatahvadi Ghrita* administered for seven days to nourish ocular tissues and stabilize retinal function.
Observations & Results: Post-treatment evaluation indicated improved visual acuity in Snellen's distant vision chart from 6/12 to 6/9 in Right eye, and 6/9 to 6/6 in Left eye. Near vision improved from N9 to N6 in the right eye, while it remained N6 in the left eye. HbA1c level reduced from 8.8% before treatment to 7.6% after treatment. Retinal haemorrhages were reduced, and retinal vascular integrity was enhanced through Direct Ophthalmoscopy and colour fundus photograph. Subjective improvement was reported in clarity of vision, reduced blurriness, and overall ocular comfort. No adverse effects were observed.
Conclusion: This case study highlights the potential of Ayurveda interventions in managing NPDR by integrating detoxification, ocular nourishment therapies. This treatment has an important role as therapeutic and prophylactic measure for Non proliferative Diabetic Retinopathy.

Keywords: Pramehajanya Timira, Madhumehajanya Timira, Diabetic Retinopathy, NPDR, Netra Tarpana, Diabetic eye disease.

1. Introduction

Diabetes mellitus encompasses a group of metabolic disorders characterized by chronic hyperglycaemia resulting from defects in insulin secretion, insulin action, or both. Prolonged hyperglycaemia is associated with progressive damage, dysfunction, and eventual failure of various organ systems, notably the eyes, kidneys, nerves, heart, and vasculature.[1]
Diabetic retinopathy (DR) is a prominent micro vascular complication of diabetes that affects vision. Elevated blood glucose levels activate the polyol pathway, wherein glucose is converted to sorbitol. Accumulation of sorbitol contributes to thickening of the basement membrane of retinal capillaries, loss of pericytes, and disruption of the blood-retinal barrier (BRB). These changes promote capillary occlusion and retinal ischemia, which in turn trigger hypoxia-induced up regulation of vascular endothelial growth factor (VEGF) via activation of hypoxia-inducible factor 1 (HIF-1).[2] Additionally, persistent low-grade inflammation has been consistently documented across various stages of DR in both experimental models and human subjects, further exacerbating retinal damage.[3]
These micro vascular alterations can culminate in significant visual impairment. If left untreated, they may lead to irreversible structural damage to the retina and permanent vision loss. The asymptomatic nature of early DR highlights the necessity of routine ophthalmic screening in diabetic individuals to enable timely diagnosis and intervention.
The estimated national prevalence of DR in India is approximately 12.5%, with 4.0% of cases progressing to vision-threatening diabetic retinopathy (VTDR), which remains the leading cause of blindness among working-age adults. [4]

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Several risk factors have been consistently associated with the development and progression of DR, including longer duration of diabetes, coexisting hypertension, elevated fasting blood glucose
Level, exclusive insulin therapy, family history of diabetes, limited awareness, and poor socioeconomic status.[5]
Current therapeutic strategies for DR focus on maintaining optimal glycaemic control and regular screening during the non-proliferative stage. Advanced stages are managed with interventions such as intravitreal anti-VEGF injections, corticosteroid therapy, pan-retinal photocoagulation, and vitrectomy. [6] However, treatment outcomes vary significantly among patients, with 40–50% of eyes showing suboptimal response to anti-VEGF therapy. These interventions are invasive, expensive and carry risks of complications, underscoring the need for alternative and complementary therapeutic approaches.
Ayurveda classifies *Prameha* as a *Mahagada*, a grave and complex group of disorders characterized by *Prabhuta*, *Sandra* and *Avila mutrata*. The pathogenesis of *Prameha* unfolds in a sequential manner, involving the *Tridoshas*, all *Dhatus*, and vital components such as *Kleda*, *Vasa*, and *Ojas*. The clinical manifestations observed in Diabetes Mellitus align closely with the *Vatika* stage of *Prameha*, specifically the *Madhumeha*. [7]
Classical texts of Ayurveda do not offer a direct terminological equivalent for ocular manifestation of *Prameha*. Diabetic retinopathy and other diabetes-induced ocular pathologies that impair vision may be conceptually aligned with the progression of *Prameha* resulting in *Timira*.
Acharya Sushruta presents a well-defined, stage wise *Samprapti* of *Prameha*. He emphasizes the concept of *Rasayani Dourbalya*, a weakening of the structural and functional integrity of the nutritive channels, particularly those associated with *Rasa*, *Pitta*, *Kapha*, and *Rakta*.[8] This deterioration, interpreted as vascular fragility, is considered a primary factor in the development of complications in *Prameha*. In progressive stages the pathology advances to *Raktha*, *Mamsa*, *Meda* resulting in *Sopha*. Concurrently, there is progressive *Dhatvagni Mandya*, *Dhatu Dushti*, *Dhatu Shithilata*, leading to impaired tissue formation.

2. CASE REPORT

2.1 Chief Complaint and History:

A 52 year old male patient approached the OPD of Shalakya Tantra (Branch of Ayurveda dealing with diseases above the clavicle), JSS Ayurveda Medical Hospital, Mysuru, India with complains of blurring of vision in right eye since 6 months. The patient was asymptomatic until six months ago, after which he developed blurring of vision in right eye for both near and distant vision not associated with any other complaints. No history of spectacle usage or previous ocular surgeries in the past. He is a known case of Diabetes Mellitus since 10 years, and was under Tab Metformin 500mg twice daily on and off and his blood sugars were not under control. Seeking relief for the deteriorating vision he approached our hospital.

2.2 Clinical Examination

General Physical Examination:
Built – Moderate
Appearance – Mesomorphic
Nourishment – Well Nourished
Pallor/Icterus/Oedema/Cyanosis/Clubbing/Koilonychia – Absent

***Ashtasthana Pareeksha* (eight folds examination of patient):**
Nadi (Pulse) - 80 bpm
Mootra (Micturition) – *Anavila* (Nonturbid), 4-5 times/day
Mala (Bowel) – *Abadha* (Non-constipated), once a day
Jihwa (Tongue) – *Alpalipta* (Mild coated)
Shabdha (Speech) – *Spashta* (Clear)
Sparsha (Touch) – *Prakrutha* (Normal)
Drik (Eye) – *Vikrutha* (Abnormal)
Akrithi (General Body built) – *Madhyama* (Moderately built)

***Sthanika Pareeksha* (Local Examination)**
Ocular Examination
Head posture: Straight and erect
Forehead: Wrinkling Present
Face: Symmetrical
Eyebrows: Normal

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Table 1 Slit lamp Bio-microscopy Examination

Slit lamp Bio-microscopy examination	**OD**	**OS**
Eyelid lids	NAD	NAD
Eye lashes	NAS	NAS
Eyelid margin	NAD	NAD
Conjunctiva	NAD	NAD
Cornea	Clear	Clear
Pupil	3 RRR	3 RRR
Lens	Transparent	Transparent

Table 2 Visual Acuity Test

Visual Acuity	**OD**	**OS**
Distant Vision	6/12p	6/9
Near Vision	N9p	N6
Pinhole	6/6p	6/6p

Table 3 Fundus Examination

		OD	**OS**
Media		Clear	Clear
Blood Vessels	Venous beading Venous looping Venous dilatation	Absent Absent Present	Absent Absent Present
Optic disc	Shape Color CD Ratio	Oval Orange 0.3	Oval Orange 0.3
General background			
Micro aneurysms		Present	Present
Hemorrhages	Superficial(flame shaped) Deep (Dot Blot)	Present	Absent
Exudates	Hard exudates Cotton wool spots	Present Absent	Absent Absent
Macula	Foveal reflex Edema	Present Absent	Present Absent

2.3 Investigation

Blood Glucose Level

Table 4 Blood glucose level before treatment

FBS	159 mg/dl
PPBS	228 mg/dl
HbA1c	8.8 %

Dilated Color Fundus Photography before treatment is shown in Figure 1.

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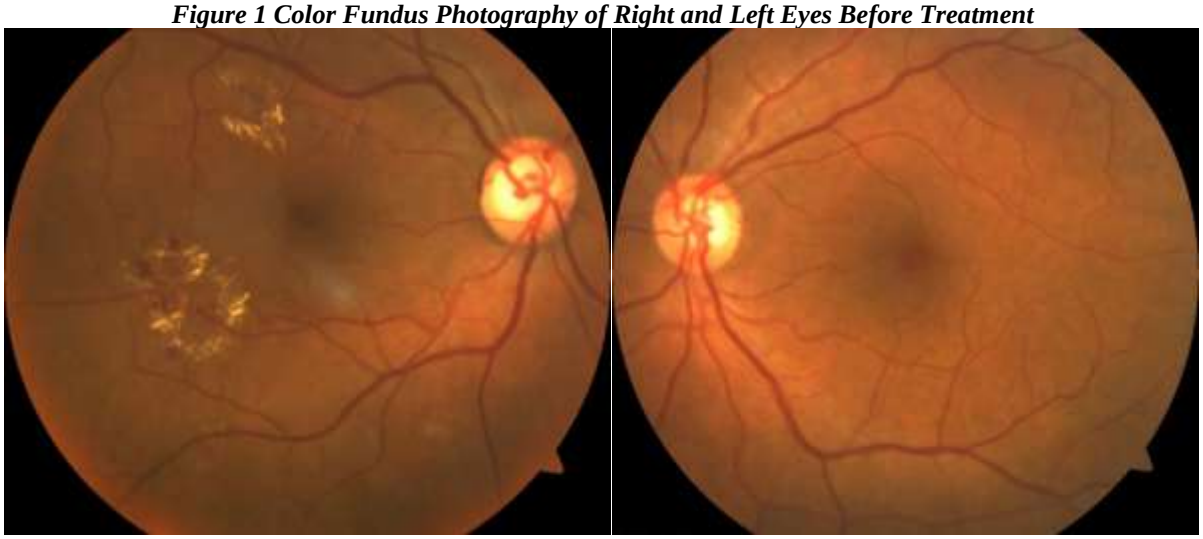
Figure 1 Color Fundus Photography of Right and Left Eyes Before Treatment



2.4 Therapeutic Intervention

The treatment strategy adhered to *Shodhana* (Purification therapy) and *Shamana Chikitsa* (Pacifying therapy), integrating localized therapies with internal medications specifically tailored for improving the vascular integrity in the retinal vessels. A detailed list of Therapeutic Intervention including oral medications along with their dosage and duration, is provided in Table 5.

Table 5 Therapeutic Intervention

Therapeutic Intervention	**Formulation**	**Dose**	**Duration**
Sadyovirechana	*Gandharvahastadi Eranda Taila*	30ml	1 day
Netra Tarpana	*Shatahvadi Ghrita*	Q. S.	7 days
Oral Administration	*Nishamalaki*	1 BD	1 Month
Oral Administration	*Brihat Vasakadi Kashaya*	15ml TID	1 Month

2.5 Monitoring and Outcome Evaluation:

Patient was monitored on weekly basis. Improvement in visual acuity was assessed using Snellen's Distant and Near vision chart alongside subjective feedback from the patient. No adverse effects were observed throughout the study period. The steady improvement in visual acuity over the course of 30 days demonstrates both subjective and objective improvement in vision. Fundus images obtained after 30 days of treatment shows reduction in hemorrhages improved vascular perfusion.

3. Results

Visual acuity was evaluated using Snellen's Distant and Near vision chart for Right and Left eye individually on Day 8 and Day 30 and during follow up on Day 60. Visual Acuity decreased soon after Tarpana treatment, but gradually improved during oral medication and follow up. Improvement in the visual acuity over time is given in Table 6.

Table 6 Visual Acuity After Treatment

Visual Acuity	**Day 8**		**Day 30**	
	OD	**OS**	**OD**	**OS**
Distant Vision	6/18	6/12p	6/9	6/6p
Near Vision	N9p	N6	N6p	N6
Pinhole	6/6p	6/6p	6/6	6/6

Fundus examination through dilated fundus photography on day 30 showed reduction in hemorrhages. (Figure 2) Changes in Blood Glucose level are mentioned in Table 7.

Table 7 Blood glucose level after treatment

FBS	123 mg/dl
PPBS	189 mg/dl
HbA1c	7.6 %

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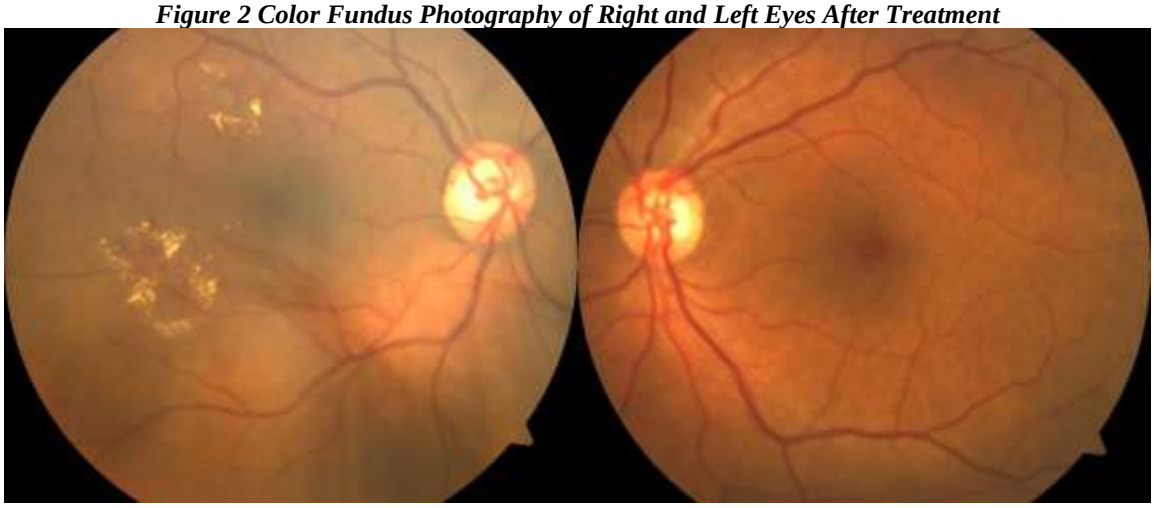
Figure 2 Color Fundus Photography of Right and Left Eyes After Treatment



4. Discussion:

Mridu Rechana facilitates the liquefaction and elimination of *srotogata mala*[9] thereby improving microcirculatory perfusion in retinal vessels. This enhanced vascular clearance promotes more efficient absorption and bioavailability of the medicated *Ghrita* administered during *Netra Tarpana*.

Eranda (Ricinus communis) additionally exhibits potent antioxidant activity, closely linked to its anti-inflammatory effects. Experimental studies demonstrate that *Eranda* constituents effectively scavenge free radicals such as DPPH and nitric oxide, thereby attenuating oxidative stress and reducing downstream inflammatory signaling.[10]

The therapeutic efficacy of *Netra Tarpana* in NPDR arises from a multi-targeted mechanism at the interface of *Ayurvedic* pharmacology and molecular biology. Clinical improvements are plausibly mediated through antioxidant, anti-inflammatory, and vasoprotective actions, supported by in vitro and cell line evidence for the phytoconstituents of *Shatahvadi Ghrita*.

Countering Oxidative Stress (Nrf2 Activation, ROS Scavenging):

Chronic hyperglycaemia generates ROS that damage retinal pericytes and endothelial cells. The lipid-soluble antioxidants in medicated Ghrita neutralizes this oxidative load.

- *Glabridin (Yashtimadhu):* Reduces glucose-induced ROS in ARPE-19 cells via Nrf2/HO-1 upregulation, enhancing antioxidant enzyme activity.[11]
- *Glycyrrhizin (Yashtimadhu):* Inhibits NADPH oxidase, lowering superoxide radical generation. [12]
- *Rosmarinic Acid (Kakoli) & Gallic Acid (Ksheerakakoli):* Potent radical scavengers with high ORAC values, protecting lipids and proteins. [13,14]

Mitigating Inflammation (NF-κB Pathway Inhibition):

Retinal inflammation in NPDR is driven by cytokine upregulation.

- *Quercetin (Eranda, Yashtimadhu):* Suppresses NF-κB in retinal endothelial cells, reducing TNF-α, IL-6, IL-1β, VEGF. [15]
- *Rutin (Yashtimadhu):* Stabilizes capillaries and inhibits prostaglandins and cytokines. [16]
- *Kaempferol (Prapoundareeka):* Blocks RAGE expression, preventing AGE-induced NF-κB activation. [17]

Protecting Vasculature (Anti-VEGF, Endothelial Stabilization):

Breakdown of the blood-retinal barrier (BRB) is central to NPDR.

- *Berberine (Daruharidra):* Inhibits HIF-1α/VEGF signaling, reducing VEGF secretion under hypoxia/high glucose. [18]
- *Piperine (Pippali):* Suppresses VEGF-induced angiogenesis and tube formation in HUVECs. [19]
- *Rutin & Quercetin:* Strengthen endothelial tight junctions, reducing vascular permeability. [20,21]

Netra Tarpana establishes a localized reservoir of bioactive compounds, with the Ghrita base facilitating trans-scleral and trans-conjunctival penetration. Once absorbed, these act synergistically to, neutralize oxidative stress via scavenging and Nrf2 activation, suppress chronic inflammation by NF-κB inhibition and cytokine downregulation and stabilize retinal vasculature through VEGF suppression and BRB reinforcement.

Nishamalaki and *Vasakadi Kashaya* due to its anti-oxidant and anti-inflammatory property increases insulin sensitivity, reduces hyperglycaemia and there by improves retinal blood circulation. [22,23]

This integrative mechanism explains clinical improvements in vision and objective signs such as micro aneurysms and intra-retinal haemorrhages. Limited effect on hard exudates and cotton wool spots reflects their slower resolution, requiring prolonged metabolic stabilization.

5. Conclusion:

This case report reinforces the potential efficacy of Ayurveda in managing Retinopathy changes in Diabetic patients Given the rising prevalence of Diabetes Mellitus and its complications in developing countries such as India, integrating traditional systems like Ayurveda may offer a safe, natural, and cost-effective alternative or complement to standard care. To validate these observations and establish standardized Ayurveda protocols for Diabetic Retinopathy, further research involving controlled clinical trials and objective visual assessment is essential. Nevertheless, this case provides compelling evidence of the integrative potential between the ancient wisdom of Ayurveda and the advancements of contemporary medicine.

6. Patient Perspective

I was diagnosed with diabetic retinopathy, and my vision had started to deteriorate. After starting Ayurvedic treatment, I noticed gradual improvement. Within a few weeks, my vision became clearer, the floaters reduced, and I felt more confident in daily activities. I am very satisfied with the outcome. Ayurveda not only helped in controlling my eye condition but also improved my overall lifestyle and well-being.

7. Patient Consent Declaration

The authors confirm that they obtained the patient's permission to share details of this case, including related images and information, for publication. The patient understands that while their name and initials won't be used and steps will be taken to protect their identity, complete anonymity may not be guaranteed.

8. Financial Support and Sponsorship

None.

9. Conflicts of Interest

The authors declare no conflicts of interest.

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